

Removable Beryllium Contamination Found on Radiation Monitoring Instruments

PURPOSE

This Bulletin provides information on a safety concern that may impact operations at Department of Energy (DOE) facilities. Specifically, the concern is the discovery of removable beryllium contamination on radiation monitoring instruments which had been in storage for an extended period of time.

BACKGROUND

On March 31, 2005, Lawrence Livermore National Laboratory submitted an occurrence report concerning the discovery of beryllium contamination on radiation monitoring instruments (i.e., Fidler Probe). (ORPS Report OAK—LLNL-LLNL-2005-0029)

The instrument in question is a large area, sodium iodide scintillation detector optimized for low-energy X-ray and gamma radiation detection. This probe was originally conceived to detect plutonium as part of the "Broken Arrow" emergency response instrumentation kits.

The standard instrument utilizes a thin sodium iodide crystal, quartz light pipe, photomultiplier tube, and beryllium radiation entrance window hermetically sealed within aluminum housing.



DESCRIPTION OF EVENT

A technician was determining whether the laboratory's old, non-functioning sodium iodide scintillation detector probes could be repaired or should be packaged for disposal. The probes had been stored in the laboratory's calibration facility for a long period of time, likely over 10 years. The technician requested precautionary swipes of probes to determine if there was any surface contamination, after being told that some of the probes might have beryllium windows.

The preliminary results of the beryllium swipes showed elevated levels of surface contamination. The source of the beryllium contamination was believed to be oxidation of unprotected beryllium windows on the old probes.

Inhalation of beryllium dust or particles can cause chronic beryllium disease (CBD) or beryllium sensitization. CBD is a chronic, often debilitating, and sometimes fatal lung condition. Beryllium sensitization is a condition in which a person's immune system becomes highly responsive (allergic) to the presence of beryllium in the body. There has long been scientific consensus that exposure to airborne beryllium is the only cause of CBD.

Immediate Corrective Actions

The laboratory took prompt corrective actions, including:

- All areas where the probes were stored or handled were isolated.
- Swipes were taken in adjacent areas.
- Air monitoring was initiated to determine if there was any airborne contamination.
- Occupational medical personnel spoke with the workers who may have handled the probes to assure they are informed of the hazards of their potential beryllium exposure.
- All of these types of sodium iodide scintillation detector probes at the laboratory were located and swiped.

Other unexpected sources of potential beryllium exposures have been identified at DOE facilities. A review of the DOE Lessons Learned Database resulted in the following examples:

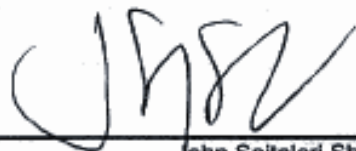
- Non-sparking beryllium alloy tools (Y-2001-OR-BWXTY12-0801)
- Mounting brackets for transport cradle (2002-KCP-FMT-KC-0003)
- Bridge crane power bus system (2003-RL-PNNL-0001)
- Industrial grinding wheels (R-2000-OR-LMESY12-0701)

ACTIONS TO BE CONSIDERED

Below are some actions that should be considered at all sites to mitigate the hazards from similar occurrences:

- Sites should identify if they have similar sources of beryllium contamination (for example, do they have sodium iodide scintillation detector probes with beryllium windows in use or in storage). Specifically, sites should determine if they have beryllium articles that, through mechanical (e.g., physical abrasion) or chemical (e.g., oxidation over extended time periods) processes, could be a source of beryllium contamination.
- Sites should consider controlling worker exposure to any sources of beryllium contamination that they find.
- Sites should consider replacing beryllium articles that are a source of beryllium contamination with alternate, non-beryllium containing materials.
- Sites should keep employees with beryllium medical work restrictions from working with beryllium articles that are a source of beryllium contamination.
- Sites should consider offering a beryllium-induced lymphocyte proliferation test (BeLPT) to employees who may have had an exposure to airborne beryllium from working with beryllium articles that are a source of beryllium contamination.

If you have questions, please call me or have staff call David Weitzman at (301) 903-5401 or Bill McArthur at (301) 903-9674 or by e-mail at bill.mcarthur@eh.doe.gov.



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